****

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

NASA-05312 (June 2004)
NASA
Superseding NASA-05312 (December 2003)

****

SECTION TABLE OF CONTENTS

DIVISION 05 - METALS

SECTION 05312

STEEL ROOF DECK

06/04

****

NASA-05312 (June 2004)
NATIONAL AERONAUTICS **NASA**
AND SPACE ADMINISTRATION **Superseding NASA-05312**
(December 2003)

****

SECTION 05312

STEEL ROOF DECK
06/04

****

NOTE: Delete, revise, or add to the text in this section to cover project requirements. Notes are for designer information and will not appear in the final project specification.

This section covers short-span, narrow-rib-type, steel roof decking to receive insulation board, and built-up roofing.

Drawings must include the following:

A complete design indicating the character of the work to be performed and giving the roof framing, metal roof deck section properties, details of cant strips and other accessories, details of openings, and sufficient dimensions to convey adequately the quantity and nature of the required metal roof decking

Assumed loads and other design data as may be required for the proper preparations of shop drawings

Metal decking for roof construction consisting of concrete fill placed over metal decking is specified in Section 05311, "Steel Floor Deck."

Metal decking for roof construction consisting of concrete fill placed over short-span, corrugated-type, metal form decking is specified in Section 03131, "Permanent Steel Forms."

Fire-resistance-rated roof and ceiling constructions using rib-type metal roof decking are described in Underwriters Laboratories inc., (BXUV) "Fire Resistance Ratings" (included in UL FRD) and the "fire resistance ratings" contained in the National Building Code, recommended by the American Insurance Association AIA CO-1.

****

PART 1 GENERAL

1.1 REFERENCES

****

NOTE: The following references should not be manually edited except to add new references. References not used in the text will automatically be deleted from this section of the project specification.

****

The publications listed below form a part of this section to the extent referenced:

AMERICAN IRON AND STEEL INSTITUTE (AISI)

AISI SG-913	(1991) LRFD Cold-Formed Steel Design Manual

AMERICAN WELDING SOCIETY (AWS)

AWS A2.4	(1998) Standard Symbols for Welding, Brazing and Nondestructive Examination
AWS A5.1	(2003) Specification for Carbon Steel Electrodes for Shielded Metal Arc Welding
AWS D1.3	(1998) Structural Welding Code - Sheet Steel

ASTM INTERNATIONAL (ASTM)

ASTM A 123/A 123M	(2002) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 36/A 36M	(2003a) Standard Specification for Carbon Structural Steel
ASTM A 446/A 446M	(2003) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality
ASTM A 525	(1993) Standard Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
ASTM A 525M	(1991; Rev A) Standard Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process (Metric)
ASTM A 526/A 526M	(1990) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Commercial Quality
ASTM A 780	(2001) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM D 1056	(2000) Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber

ASTM D 1149	(1999) Standard Test Method for Rubber Deterioration - Surface Ozone Cracking in a Chamber
ASTM D 746	(1998e1) Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact
ASTM E 84	(2003) Standard Test Method for Surface Burning Characteristics of Building Materials

1.2 DESIGN REQUIREMENTS

1.2.1 Properties of Sections

Properties of metal roof deck sections shall be computed on the basis of the effective design width as limited by the provisions of AISI SG-913.

Roof deck section properties, including section modulus and moment of inertia per foot [millimeter] [_____] of width, shall equal or exceed the required values of section properties indicated.

1.2.2 Allowable Loads

Total uniform dead and live load for detailing purposes shall be as indicated.

1.3 SUBMITTALS

****

NOTE: Review submittal description (SD) definitions in Section 01330, "Submittal Procedures," and edit the following list to reflect only the submittals required for the project. Submittals should be kept to the minimum required for adequate quality control. Include a columnar list of appropriate products and tests beneath each submittal description.

****

The following shall be submitted in accordance with Section 01330, "Submittal Procedures," in sufficient detail to show full compliance with the specification:

SD-02 Shop Drawings

Fabrication drawings for the following items shall be in accordance with the paragraph entitled, "Fabrication," of this section.

Roof Deck Units
Roof Sump Pans
Cant Strips
Ridge and Valley Plates
Metal Closure Strips

Installation drawings for Metal Deck Units shall be in accordance

with the paragraph entitled, "Installation Information," of this section.

SD-03 Product Data

Manufacturer's catalog data shall include type, voltage and amperage for the following items:

Welding Equipment
Welding Rods and Accessories

SD-04 Samples

Samples of the following shall be submitted in accordance with paragraph entitled, "Fabrication," of this section.

Metal Roof Deck Unit
Flexible Closure Strip

SD-07 Certificates

Welding Procedures shall be in accordance with AWS D1.3.

Certificates for Metal Roof Deck Unit shall show compliance with UL listing. Certificates for Welder Qualifications shall be in accordance with the paragraph entitled, "Qualifications for Welding Work," of this section.

Certificates shall also be provided for the following items:

Joint Sealing Material
Galvanizing Repair Paint
Flexible Closure Strips

SD-08 Manufacturer's Instructions

Installation Instructions metal floor deck units shall be submitted in accordance with paragraph entitled, "Installation Information," of this section.

1.4 QUALIFICATIONS FOR WELDING WORK

****
NOTE: If Section 05095, "Welding Steel Construction," is not included in the project specification, applicable requirements therefrom should be inserted and the following paragraph deleted.
****

Manufacturer's catalog data for Welding Equipment and Welding Rods and Accessories shall include type, voltage and amerpage.

Welder Qualifications shall also be submitted to the Contractor for review.

[Section 05095, "Welding Steel Construction," applies to work specified in this section.]

[Welders shall have been qualified by tests in accordance with AWS D1.3.]

Welding Procedures shall be in accordance with AWS D1.3.

1.5 DELIVERY, STORAGE, AND HANDLING

Decking stored at the site before erection shall be stacked on platforms or pallets and covered to provide an enclosure, while affording proper air circulation.

Packaged materials shall be stored in their original, unbroken package in a dry area until needed for installation.

Decking shall not be used for storage or as a working platform until the roof deck units have been permanently fastened in position. Roof decking shall not be damaged or overloaded during construction.

1.6 INSTALLATION INFORMATION

Installation Instructions shall indicate the manufacturer's recommended method and sequence of installation for Metal Deck Units.

Field measurements shall be taken prior to preparation of drawings and fabrication.

Details and layouts indicating the structural framing, location, length, and markings of metal deck units corresponding with the sequence and procedure to be followed in placing and fastening deck units, and the location, type, and sequence of welded connections.

Welds shall be indicated in accordance with AWS A2.4.

Deck unit cross section with dimensions; and complete computations of deck unit section properties.

Accessories and methods of installation, including reinforcement at openings.

Size and number of openings to be cut in metal decking.

When required, the location of metal deck cells to be used for air ducts.

When required, the location of metal deck cells to be used for electrical raceways.

When both fire resistance rated and nonrated construction are required, the location of fire resistance rated construction.

Installation Instructions shall indicate the manufacturer's recommended method and sequence of installation for.

PART 2 PRODUCTS

2.1 STRUCTURAL QUALITY STEEL SHEETS

Sheets shall be hot-dip galvanized carbon steel having minimum yield point of 33,000 pounds per square inch (psi) 230 Megapascal, conforming to ASTM A 446/A 446M, Grade A, with zinc coating conforming to ASTM A 525 ASTM A 525M, [G60] [G90].

2.2 COMMERCIAL QUALITY STEEL SHEETS

Sheets shall be hot-dip galvanized carbon steel conforming to ASTM A 526/A 526M, with zinc coating conforming to ASTM A 525 ASTM A 525M, [G60] [G90].

2.3 GALVANIZED STEEL ANGLES

Angles shall be hot-rolled carbon steel conforming to ASTM A 36/A 36M, merchant quality, Grade Designation SAE/AISI 1023 or SAE/AISI 1025, and hot-dip galvanized in accordance with ASTM A 123/A 123M.

2.4 ELECTRODES FOR MANUAL SHIELDED METAL ARC WELDING

Electrodes shall be E60 series, covered mild electrodes, conforming to requirements of AWS A5.1.

2.5 JOINT SEALING MATERIAL

Material shall be a nonskinning, gun-grade, bulk compound as recommended by the manufacturer.

2.6 GALVANIZING REPAIR PAINT

Paint shall be high zinc-dust content paint for regalvanizing welds in galvanized steel and shall conform to ASTM A 780.

2.7 FLEXIBLE CLOSURE STRIPS

****
NOTE: Delete paragraph heading and following paragraphs when fire-resistance-rated construction is required.
****

Strips shall be made of the elastomeric material specified and shall be premolded to the configuration required to provide tight-fitting closures at open ends and sides of steel roof decking.

Elastomeric material shall be a vulcanized, closed-cell, expanded chloroprene elastomer having approximately 3.5 psi 25 kilopascal compressive-deflection at 25 percent deflection (limits), conforming to ASTM D 1056, Grade No. SCE 41, with the following additional properties:

Brittleness temperature shall be minus 40 degrees F minus 40 degrees C when tested in accordance with ASTM D 746.

Flammability resistance shall have a flame spread rating of less than 25 when tested in accordance with ASTM E 84.

Resistance to ozone shall be "no cracks" after exposure of a sample kept under a surface tensile strain of 25 percent to an ozone concentration of 100 parts per million of air by volume in air for 100 hours at 104 degrees F 40 degrees C and tested in accordance with ASTM D 1149.

Adhesive shall be elastomeric type with a chloroprene base as recommended by the manufacturer of the flexible closure strips.

2.8 FABRICATION

One sample of Metal Roof Deck Unit used shall be furnished to illustrate actual cross section dimensions and configurations.

One sample of each type Flexible Closure Strip, 12-inches 300 millimeter long, shall also be furnished.

2.8.1 Roof Deck Units

Units shall be fabricated from [_____] thick structural-quality steel sheets before galvanizing.

Units shall be [narrow] [wide] [_____] rib, Type [A] [_____], having depth of not less than [1-1/2] inches [38] millimeter [_____], longitudinal ribs spaced not more than 6 inches 150 millimeter on center, telescoped or nested endlaps, and nested or overlapping type sidelaps.

Ribs of short-span deck units that are welded from the top shall have not less than 1/2-inch 13 millimeter nominal width on the bottom surface.

Units shall be of sufficient length to span three or more spacings where possible.

2.8.2 Roof Sump Pans

Pans shall be fabricated from a single piece of the specified structural-quality steel sheet not less than nominal 0.0747-inch 1.9 millimeter thick before galvanizing. Pans shall be of adequate size to receive roof drains and shall be recessed not less than 1-1/2-inches 38 millimeter below roof deck surface with level bottoms and sloping sides to direct water flow to roof drain, and bearing flanges not less than 3-inches 75 millimeter wide.

2.8.3 Cant Strips

****

NOTE: When cant strips exceeding the dimensions specified in the following paragraph are required, the steel sheet quality and thickness must be revised as required.

****

Strips shall be fabricated from the specified commercial-quality steel sheets not less than nominal 0.0359-inch 0.91 millimeter thick before galvanizing. Strips shall be bent to form a 45-degree cant not less than 5-inches 125 millimeter wide; top and bottom flanges shall be not less than 3-inches 75 millimeter wide. Length of strips shall be 10 feet 3000 millimeter where possible.

2.8.4 Ridge and Valley Plates

Plates shall be fabricated from the specified structural-quality steel sheets, not less than nominal 0.0359-inch 0.91 millimeter thick before galvanizing. Plates shall be not less than 4-1/2-inches 120 millimeter wide and bent to provide tight fitting closures at ridges and valleys. Minimum length of ridge and valley plates shall be 10 feet 3000 millimeter where possible.

2.8.5 Metal Closure Strips

Strips shall be fabricated from the specified commercial-quality steel sheets not less than nominal 0.0359-inch 0.91 millimeter thick before galvanizing. Strips shall be of the configuration required to provide tight-fitting closures at open ends and sides of steel roof decking.

PART 3 EXECUTION

3.1 GENERAL

Metal roof deck units and accessories shall be installed in accordance with the approved shop drawings and descriptive data and as specified.

3.2 WELDING

Procedures for welding, appearance and quality of welds made, and methods used for correcting welding work shall conform to AWS D1.3.

Metal sheets shall be attached to structural members by plug welding through special welding washers supplied by the manufacturer.

3.3 PLACING ROOF DECK UNITS

Supporting members shall be completely in place before placing of units is started. Units shall be placed on supporting steel framework; adjusted to final position with ends bearing on the supporting members; and accurately aligned, end to end, before being permanently fastened. Endlaps shall be not less than 2 inches 50 millimeter. Placing and aligning of units shall be done to maintain the required number of units indicated on the approved shop drawings and to prevent stretching or contracting of the sidelap interlocks.

A vent clip of suitable design as recommended by the manufacturer of the metal sheet shall be provided at the sidelaps of each sheet after sheets are fastened in place. For beam spacing of 4 feet 1200 millimeter and less, one vent clip shall be installed at midspan; for beam spacing over 4 feet 1200 millimeter, two vent clips shall be placed at the third points.

3.4 FASTENING ROOF DECK UNITS

****

NOTE: When fire-resistance-rated construction is required, the fire rating agency's specification for the applicable roof and ceiling construction must be consulted.

****

Units shall be fastened to steel supporting members by welding, unless otherwise specified. Spacing of welds shall not exceed 6 inches 150 millimeter on center at endlaps and 12 inches 300 millimeter on center at all intermediate supports, both parallel and perpendicular to deck span. Welds shall be 1/2-inch 13 millimeter minimum diameter fusion welds. Welding sequence and procedure shall be coordinated with placing of units.

For spans exceeding 3 feet 900 millimeter center-to-center of the supporting member, sidelaps between adjacent units shall be locked together at intervals not exceeding 30 inches 750 millimeter on center by welding or button punching.

3.5 JOINT SEALING

Sidelaps and endlaps shall be sealed with manufacturer's recommended joint sealing material. Material shall be shop or field applied. Before applying the sealing material, dust, dirt, moisture, and other foreign material shall be completely removed from the surfaces to which the sealing material is to be applied. Sealing material shall be applied in strict accordance with the sealing material manufacturer's printed instructions.

3.6 CUTTING AND FITTING

Cutting and fitting of roof deck units and accessories shall be performed where indicated and as required for passage of other work projecting through, or adjacent to, roof decking.

Additional metal reinforcement and closure pieces shall be provided as required for strength, continuity of roof decking, or support of other work.

3.7 REINFORCEMENT AT OPENINGS

****
NOTE: Openings larger than 30 inches 750 millimeter in any dimension must be framed with steel supporting members and provided as a part of the structural framing system.
****

Roof decking around openings 15 inches 380 millimeter and under in size shall be reinforced by means of a flat, galvanized structural-quality steel sheet placed over the opening and fusion welded to top surface of roof decking. Steel sheet shall be not less than nominal thickness of 0.0359-inch 0.91 millimeter before galvanizing and at least 12-inches 300 millimeter wider and longer in size than the opening. Spacing of welds shall not exceed 12-inches 300 millimeter on center, with not less than one weld at each corner.

Ends of roof deck units at openings over 15 to 30 inches 380 to 750 millimeter in size that are not framed with steel supporting members shall be reinforced by welding a galvanized steel angle to the underside of roof decking at right angles to roof deck ribs and extending at least three ribs beyond each side of the opening. Steel angle shall be not less than 1 by 1 by 1/4 inch 25 by 25 by 7 millimeter and shall be fillet welded to bottom surface of each rib. Opening sides parallel to roof deck ribs shall be reinforced with a flat, galvanized steel sheet welded to top surface of roof decking as specified for openings 15 inches 380 millimeter and under in size, except when a roof sump pan is to be placed over the opening.

3.8 ROOF SUMP PANS

Pans shall be placed over openings in roof decking and fusion welded to top surface of roof decking. Spacing of welds shall not exceed 12 inches 300 millimeter with not less than one weld at each corner. Opening in the bottom of each roof sump pan to receive the roof drain shall be field cut as part of the work of this section.

3.9 CANT STRIPS

Strips shall be fusion welded to surface of roof decking, secured to wood

nailers by galvanized screws or to steel framing by galvanized self-tapping screws or welds. Spacing of welds and fasteners shall not exceed 12 inches 300 millimeter. End joints shall be lapped not less than 3 inches 75 millimeter and shall be secured with galvanized sheet metal screws spaced not more than 4 inches 100 millimeter on center.

3.10 RIDGE AND VALLEY PLATES

Plates shall be fusion welded to top surface of roof decking. End joints shall be lapped not less than 3 inches 75 millimeter. For valley plates, endlaps shall be in the direction of water flow.

3.11 CLOSURE STRIPS

Closure strips shall be provided at open, uncovered ends and edges of the roof decking and in voids between roof decking and top of walls and partitions where indicated. Closure strips shall be installed in position in a manner to provide a weathertight installation.

3.12 ROOF INSULATION SUPPORT

Metal closure strips shall be provided for support of roof insulation where rib openings in top surface of metal roof decking occur adjacent to edges and openings. Metal closure strips shall be welded in position.

3.13 TOUCHUP PAINTING

After roof decking installation, scarred areas on top and bottom surfaces of metal roof decking shall be wirebrushed, cleaned, and touchup painted. Scarred areas shall include welds, weld scars, bruises, and rust spots. Galvanized surfaces shall be touched up with galvanizing repair paint. Painted surfaces shall be touched up with repair paint of painted surfaces.

3.14 CLEANING AND PROTECTION

Upon completion of the deck, surfaces shall be swept clean and left ready for installation of the roofing.

-- End of Section --